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(58) Field of search  
B3C  
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(54) Twist drill

(57) A twist drill 1 has a pair of helically extending flutes 3A, the profile of each flute 3A being such that the drill 1 is provided at its culling end with two convex curved cutting edges 5A.

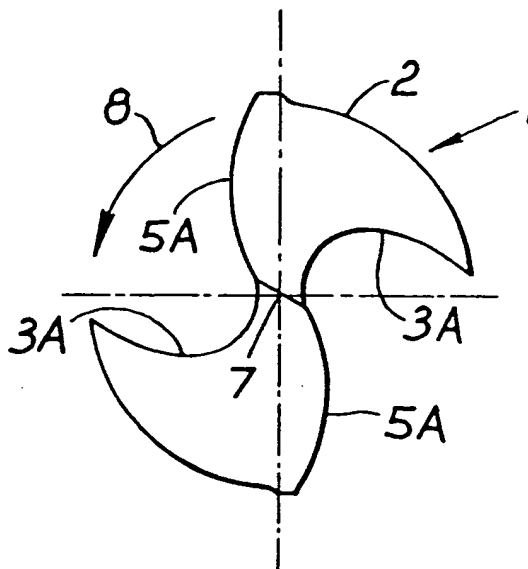


Fig. 3

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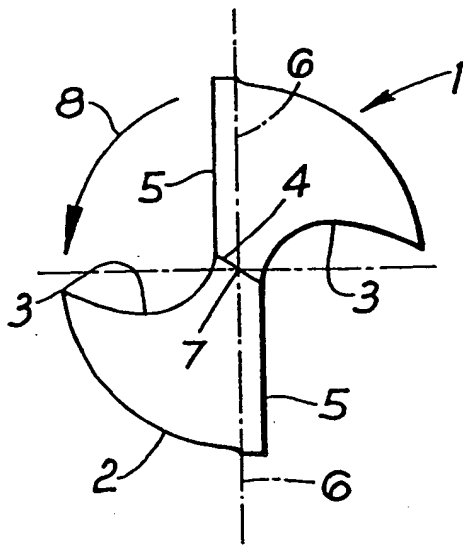


Fig. 1

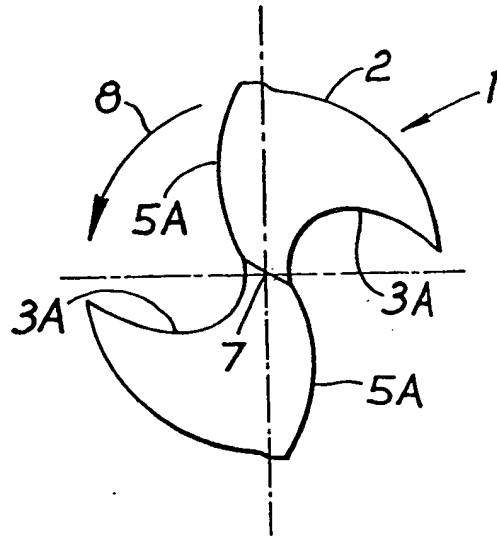


Fig. 3

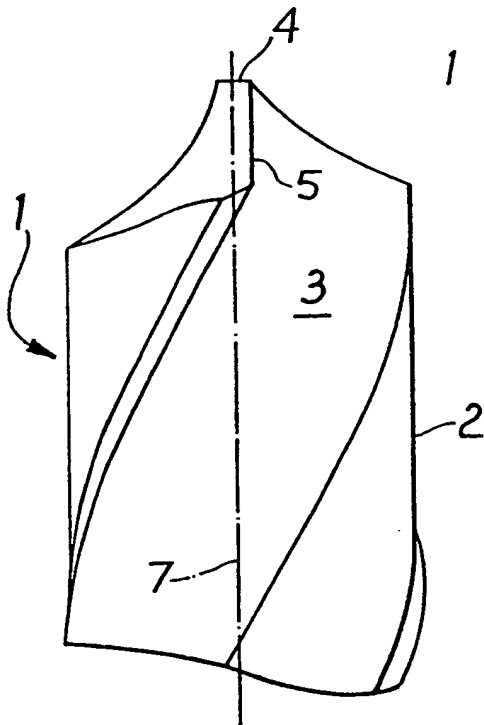


Fig. 2

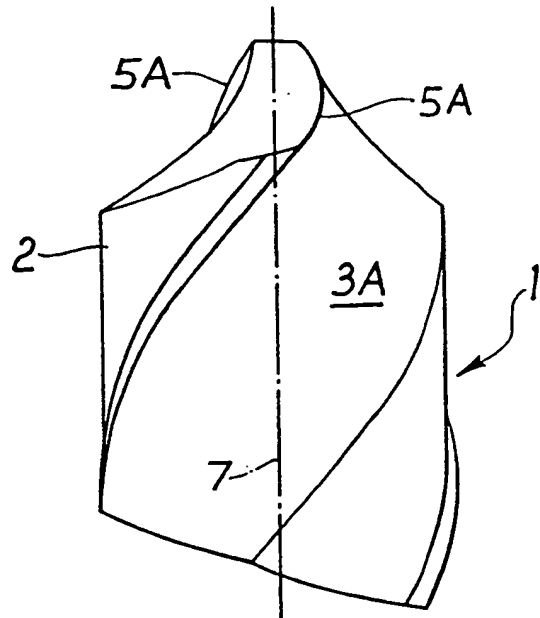


Fig. 4

## SPECIFICATION

## Twist drill

- 5 This invention relates to a twist drill comprising a cylindrical drill body into the exterior of which is machined a pair of helically extending flutes extending from a point at the cutting end of the drill and terminating at a shank at the other end of the drill, by which shank the drill is securable in a chuck, e.g. of a hand tool, drilling machine etc.

- Conventionally, the flute profiles are such that they produce a pair of substantially diametrically opposed, straight cutting edges, extending parallel to a radius extending from the longitudinal axis/axis of rotation of the drill, being produced in accordance with the design criteria laid down by Morse a century ago, with subsequent changes from Morse's proposals only being in respect of helix angles, land width ratios, and materials.

- The object of the present invention is to provide a twist drill having improved cutting characteristics over conventional twist drill designs.

- According to the present invention there is provided a twist drill having a pair of helically extending flutes, the profile of each flute being such that the drill is provided at its cutting end with two convex curved cutting edges.

- It will be appreciated that the drill in accordance with the invention departs from standard designs in that the straight cutting edges are replaced by convexly curved cutting edges, and with a drill of this design substantially improved drilling properties result. For instance, comparative tests have shown that a "standard", straight cutting edged drill, capable of drilling 300 holes satisfactorily compares with a drill in accordance with the invention, with convex curved cutting edges capable, under the same cutting conditions, of drilling 465 holes satisfactorily.

- Preferably, the helix angle of each flute is between  $34^\circ$  and  $40^\circ$ , whilst it is also preferred for the point angle to be between  $90^\circ$  and  $140^\circ$ .

- It is also preferred for the drill to have a hard material surface coating e.g. of titanium nitride, whilst as usual, the drill would be manufactured in high speed steel.

- The invention will now be described in greater detail; by way of example, with reference to the accompanying drawings, in which:-

Figure 1 is a view on the cutting end of a conventionally designed drill;

- Figure 2 is a side elevation of a portion, at the cutting end, of the drill of Fig. 1;

Figure 3 corresponds to Fig. 1 but shows a drill in accordance with the present invention; and

- Figure 4 corresponds to Fig. 3 but shows a drill in accordance with the present invention.

- A conventional drill 1, of high speed steel, illustrated in Figs. 1 and 2 comprises a cylindrical drill body 2, into which are machined, at a helix angle in the range  $25^\circ$  to  $34^\circ$ , a pair of opposed, helical flutes 3, the flutes 3 terminating at a tip 4 from which extend a pair of straight cutting edges 5, which edges are parallel to one another and parallel to a radius 6 extending from an axis 7 being the axis of rotation of the drill in use, and also the longitudinal axis of the drill, which is rotatable anti-clockwise as indicated by the arrow 8. The shank of the drill remote from the tip 4 is not illustrated, but this is of conventional design, to fit in a conventional chuck.

- Considering now the high speed steel drill of the invention illustrated in Figs. 3 and 4, the same reference numerals are employed for the same parts of the drill of Figs. 1 and 2. However, it will be observed from Figs. 3 and 4 that cutting edges 5A are no longer straight, in accordance with conventional design, but on the contrary are convexly curved, the particular curvature of the cutting edges 5A of any drill in accordance with the invention being derived, as will readily be appreciated by a person skilled in the art, from two factors, being the profile adopted for flutes 3A and the angle selected for the drill point, e.g. for the same flute profile, a  $130^\circ$  drill point angle will produce a larger radius of curvature of the cutting edges 5A, and hence a decreased or shallower curve, than a  $135^\circ$  drill point angle. The helix angle of the flutes 3A is preferably in the range  $34^\circ$  to  $40^\circ$ , the selection being, as with conventional twist drill practice, in accordance with the nature of the material to be drilled, i.e. with copper requiring a relatively slow helix angle, steel requiring a faster helix angle, and aluminium requiring a still faster helix angle.

## CLAIMS

1. A twist drill having a pair of helically extending flutes, the profile of each flute being such that the drill is provided at its cutting end with two convex curved cutting edges.
2. A twist drill as claimed in Claim 1 wherein the helix angle of each flute is between  $34^\circ$  and  $40^\circ$ .
3. A twist drill as claimed in Claim 1 or Claim 2, wherein the point angle is between  $90^\circ$  and  $140^\circ$ .
4. A twist drill as claimed in any preceding Claim, having a hard material surface coating.
5. A twist drill as claimed in Claim 4, wherein the coating is of titanium nitride.
6. A twist drill as claimed in any preceding Claim, of high speed steel.
7. A twist drill substantially as hereinbefore described with reference to Figs. 3 and 4 of the accompanying drawings.

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